



Short Report

Lethal head entrapment – A problem characteristic of early childhood

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ARTICLE INFO

Article history:

Received 12 December 2008

Accepted 13 January 2009

Available online 12 February 2009

Keywords:

Infant death

Childhood asphyxiation

Head entrapment

Accident

Inflicted injury

ABSTRACT

Accidental deaths in infancy and early childhood often result from young childrens' lack of understanding of the dangers of certain situations and their physical inability to extricate themselves from potentially lethal circumstances. Two cases are reported to demonstrate an age-related susceptibility in the young to lethal head entrapment. Case 1: a 5-month-old girl smothered when she slipped down in her stroller, trapping her head beneath the frame and forcing her face into the soft material of the base. Case 2: a 14-month-old boy was hanged while exploring a filing cabinet when his head became caught between two lower drawers. Additional mental and physical characteristics that predispose young children and infants to lethal head entrapment include an inability to effectively problem solve once confronted with a hazardous situation, and relatively large heads and weak neck musculature. Because of these features lethal head entrapment represents a particular circumstance that may predispose to accidental asphyxial deaths in the very young. A combination of careful death scene and autopsy evaluations will be required to confirm the alleged circumstances of death in these cases, including mortuary re-enactments and assessment of the deceased infant's level of physical maturity and mobility.

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1. Introduction

Infants and young children move around in their sleeping environments and also have a natural desire to explore when awake. These characteristics may lead them to wedge into gaps in their cots, or to move away from safe areas where there is parental or carer supervision into areas of a house or yard where there is risk of serious injury.¹ The following cases are reported to focus on particular circumstances that may lead to death from an age-related vulnerability to head entrapment.

2. Case reports

2.1. Case 1

A 5-month-old girl had been placed to sleep in a stroller pram without being harnessed in restraining webbing. She was found deceased having slipped through the front of the stroller with her head caught under the metal bar and her face pressed into the mattress. At autopsy a blanched area at the back of the head corresponded to the position of the bar, in keeping with the carer's story (Figs. 1 and 2). Death was attributed to asphyxia from smothering.

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Although the body was suspended there had been no obvious direct pressure on the neck to implicate hanging, with the lethal outcome resulting more from forcing of the nose and mouth into the soft mattress due to pressure from the bar at the back of the head. There were also no facial or conjunctival petechiae or other injuries externally or internally to suggest any other form of trauma and a full skeletal survey was negative. There was no evidence of underlying lethal organic illness, electrolyte analyses confirmed that there was no dehydration, and microbiologic and toxicologic studies were also negative.

2.2. Case 2

A 14-month-old boy was found with his head lodged between two drawers of a small filing cabinet in the bedroom of his home. He had been put to sleep in his cot an hour before, but was known to be able to get out of the cot through a defect in the side. It appeared that he had become caught while looking into the bottom drawer of a cabinet when the drawer above had moved forward entrapping his head (Fig. 3). At autopsy there were numerous facial and occasional conjunctival petechiae with bruises and abrasions to the neck, chin upper chest and right side of the scalp in keeping with being trapped between the two drawers. Death was, therefore, attributed to asphyxia from neck compression. There were no other injuries externally or internally to suggest any other form of trauma. There was also no evidence of underlying lethal organic illness. Radiological studies did not reveal any occult trauma and toxicologic studies were also negative.



Fig. 1. Entrapment of the head of a 5-month-old girl who had slipped down in her stroller (a) forcing her face into soft material of the base (b) (case 1) (mortuary re-enactment).

3. Discussion

Infants and toddlers are at increased risk of accidental death, often for quite different reasons to older children. Cognitive immaturity may contribute to these deaths as infants and young children may simply not understand the possible dangers of a situation. This has, for example, resulted in vehicle-related deaths where young children have run out onto roads without due consideration of nearby traffic, run-overs where toddlers have been playing on domestic driveways, and fire deaths where young children have merely moved away from flames rather than taking appropriate evasive action and leaving a burning house or vehicle. Physical



Fig. 2. A pressure mark on the back of the head in case 1 (arrow) corresponding to the position of the stroller bar.

immaturity may also contribute to a fatal outcome when, for example, an infant slips down into a gap between a mattress and a wall and cannot extricate him or herself. On occasion, death may result from a combination of both cognitive and physical factors: for example, toddlers are prone to drown in swimming pools as their lack of understanding of potential dangers may lead them to lean too far forward over the water, their higher centre of gravity predisposes to falling, their inability to understand the precarious nature of their situation allows them to become submerged beneath the water without struggling, and their lack of muscle strength and small stature prevents them from escaping.¹

In the reported cases deaths occurred because the two infants had become entrapped and had not been able to extricate themselves. In case 1 a 5-month-old girl had slipped down in her stroller and had not been able to take steps to either prevent the entrap-



Fig. 3. Entrapment of the head of a 14-month-old boy who was caught between the lower and upper drawers of a filing cabinet (case 2) (mortuary re-enactment).

ment or to lift her face from the soft base of the stroller. Her head had been caught underneath the front bar of the stroller forcing her face into soft material, resulting in death from smothering. In the second case a 14-month-old toddler had died after he had placed his head in a filing cabinet drawer and then had become entrapped once the drawer above had slid open. He had not lowered his head and freed himself from the upper drawer thus relieving pressure on his neck. In older children and adults there is a much-reduced likelihood of an individual finding him or herself in situations where lethal head entrapment may occur unless there is cognitive impairment from an underlying mental, neurological or developmental disorder, or intoxication. If an older individual does suffer head entrapment the usual process involves an assessment of the situation with removal of any pressure on the neck or face followed by extrication of the head by reversing the steps that have resulted in the position. In contrast, infants and the young are too young to be able to understand the possible significance of their entrapment and may instinctively pull back or remain hanging, thus exacerbating the situation. This was the likely situation in a young girl who asphyxiated underneath a shopping trolley.² The mechanism of death in head entrapment may involve obstruction of the external airways (as in case 1), or neck compression (as in case 2).

The present report has, therefore, demonstrated a particular circumstance that may result in a lethal outcome in the young that may be contributed to by four factors: (1) exploratory behaviour, (2) inability to perceive potential danger, (3) inability to problem solve once confronted with a hazardous situation, and (4) immature anatomical and physical characteristics. Failure to understand and deal with particular situations is an unfortunate feature of this and many other fatal early childhood accidents.³

The pathological assessment of these cases requires a careful evaluation of witness statements with death scene descriptions and documentation so that the autopsy findings can be analysed in the light of the alleged circumstances. Failure to consider these details may result in incorrectly attributing such a death to sudden infant death syndrome (SIDS) if cutaneous markings are absent or subtle.⁴ Mortuary re-enactments, as shown in the reported cases,

are invaluable in allowing physical findings such as bruises and abrasions, when present, to be matched to the position where the child's head and neck was allegedly found. Mismatch of the pattern of the injuries with the physical surroundings must raise the possibility of inflicted injury, however, it is also important to recognise that behavioural and physical characteristics of the very young predispose them to unusual forms of asphyxia, such as the ones reported.

Conflict of Interest

None declared.

Funding

None declared.

Ethical Approval

None declared.

Acknowledgements

We would like to thank the South Australian State Coroner, Mr. M. Johns, for permission to publish selected details of these cases.

References

1. Byard RW. Accidental childhood death and the role of the pathologist. *Pediatr Develop Pathol* 2000;**3**:405–18.
2. Jensen L, Charlwood C, Byard RW. Shopping cart injuries, entrapment and childhood fatality. *J Forensic Sci* 2008;**53**:1178–80.
3. Byard RW, Beal S, Bourne AJ. Potentially dangerous sleeping environments and accidental asphyxia in infancy and early childhood. *Arch Dis Child* 1994;**71**:497–500.
4. Byard RW. Possible mechanisms responsible for the sudden infant death syndrome. *J Paediatr Child Health* 1991;**27**:147–57.